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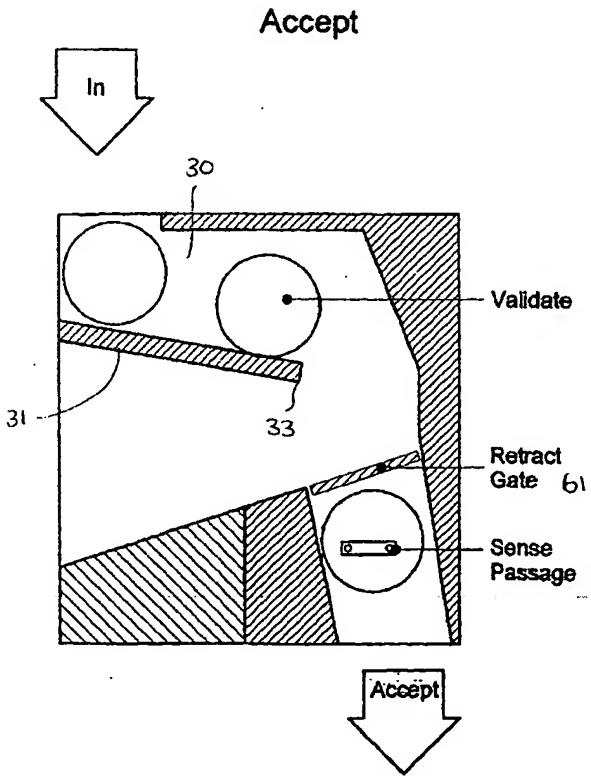
(54) Title: A SMART TOKEN AND READER DEVICE



(57) Abstract: A plastic circular contactless smart token used for storing and exchanging data with a token reader. The token reader has a housing, a token entry slit extending within said housing for placing said smart token therein. An entry passageway extending from the token entry slit formed by a declining ramp having side walls extending from the base of the ramp. The entry passageway sloping downward to thereby allow the smart token to roll down the passageway by action of gravity. Also disclosed is a selection gate located at the end of the passageway for altering the course of the token so that it is forwarded to one of at least two other passageways depending upon the position of the selection gate.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

A smart token and reader device

Field of the invention

The present invention relates to a smart token and device for reading the token.

Background of the invention

Smart tokens are devices which are capable of storing processing data. The tokens can be carried around by people in much the same way as standard coins, however for the data stored thereon to be accessed, the smart tokens can be placed into a smart token reader or used with a compatible reader.

Examples of reader/smart token combinations are shown in PCT application WO 00/57344 to Devito et al, entitled "Contactless Smart Card Reader", US Patent 5,173,705 and US Patent 5,587,955.

One problem with smart tokens is that in order for the exchange of data to occur, both the smart token and the reader often must have a conductive surface to thereby form an electrical coupling for the exchange of data. The problem with this arrangement is that there must be a proper alignment of the smart token when it is inserted into the reader, in order that the two conductive surfaces exchange data. This can result in the reader requiring a complex conveying arrangement within the reader, thereby adding to the costs of manufacturing and maintaining the reader.

Physical contact between the conductive surfaces of the token and the reader can also result in wear and tear to the respective conductive surfaces so that if the conductive surfaces becomes damaged or even dirty, an electrical coupling between the two may not be possible, resulting in loss of the exchange of data between the two.

Additionally, some smart tokens require the use of a power source such as a battery in order to continue to exchange data.

The applicant does not concede that the prior art discussed in this specification forms part of the common general knowledge in the art at the priority date of this application.

Summary of the invention

It is an object of the invention to provide an alternative form of smart token reader and smart token device.

In a first aspect of the present invention there is provided a smart token reader for reading a smart tokens or disc containing an internal communications mechanism, the reader including: a body having a first passageway defined therein for the insertion of a smart token; the first passageway including a first inclined ramp along which the token rolls upon insertion into the reader; an antenna detector located adjacent the passageway for reading information from the token as it rolls along the passageway; a selection gate located at the end of the passageway for altering the course of the token so that it is forwarded to one of at least two further passageways depending on the position of the selection gate; and wherein the position of the selection gate is set by the reader upon the reading of information stored within the token by the antenna detector.

Preferably, a first one of the two further passageways includes a second inclined ramp along which the token rolls and an exit portal at a distal end of the second inclined ramp from which the token exits from the reader. Ideally, a wall of the first passageway is formed from a detachable front panel of the reader. Further, the first inclined ramp is formed by an elongated protrusion along the detachable front panel. The detachable front panel can be attached to the reader by means of a resiliently biased hinge, resiliently biased in a closed position. The wall of the second passageway can be formed from a second front panel of the reader. The second inclined ramp is formed by an elongated protrusion along the second front panel. The second front panel includes an upturn lip along which the token rolls upon exiting of the second front panel.

In a broad aspect of the invention, there is provided a smart token for use in storing and exchanging data with a token reader device adapted to read and/or write data to said token, said token comprising:

a casing;

an integrated circuit having memory storage capabilities housed within said casing; and

an antenna housed within said casing and coupled to said integrated circuit;

wherein said token is adapted such that when placed in proximity to an electromagnetic field generated by said token reader, an electromagnetic coupling to said antenna is established and wherein said antenna is adapted to carry an electromagnetic pulse when said electromagnetic coupling has been established and thereby impart a digital signal to or receive a digital signal from, said integrated circuit.

Optionally, the casing may be made from plastic and may optionally be formed from two covers adapted to be joined together. A projection may extend from a surface of each cover such that each projection sealingly abuts the surface of said other cover and thereby forms at least one chamber for housing said integrated circuit and said antenna.

The antenna may be formed as a loop and can be positioned to extend within an inner wall of said chamber, adjacent to the perimeter of said casing.

Optionally, when the covers are joined together, one of said projections is an inner loop and the other of said projections is an outer loop, said inner loop being juxtaposed within said outer loop, to thereby form an inner chamber within said inner loop and an outer chamber between said inner and outer loops.

The integrated circuit may be located within a protective pocket that extends from an inner surface of one of said covers. The pocket can be positioned within said inner chamber and a filler material may be provided within said inner chamber.

At least one slot can be provided in the inner loop adjacent to said pocket, to permit electromagnetic pulse coupling of said integrated circuit and said antenna loop.

Preferably the casing is substantially circular.

In another broad aspect, the invention provides a smart token reader for use in storing and exchanging data with a smart token, said smart token of the type having a casing; an integrated circuit having memory storage capabilities housed within said casing; and a token antenna coupled to said integrated circuit; said smart token reader comprising:

a housing having a token entry slit extending therein to allow a smart token to enter the housing;

an entry passageway within said housing and extending from said token entry slit, to thereby permit passage of said smart token;

a reader antenna located along said entry passageway, said reader antenna adapted to transmit an electromagnetic field to thereby establish an electromagnetic coupling to said token antenna as said smart token travels past said reader antenna; and

a processor coupled to said reader antenna for the transmitting data to and/or receiving data from said smart token when said electromagnetic coupling has been established.

Optionally, the token reader further comprises a sensor located along said entry passageway to sense that said smart token is passing through said entry passageway.

Optionally, a gate means is located at the end of said entry passageway and is activated by a signal generated by said processor, said gate means adapted to alternate the passage of said smart token to either an exit passageway or a collection passageway depending upon said signal generated by said processor, said collection passageway leading to a chamber within said housing for storage of said smart token and said exit passageway leading to an exit point from said housing.

The gate means may include a blade moveable between one position in which said blade is coplanar with said entry passageway to allow said smart token to travel to one of either an exit or entry passageways, and another position in which said blade is retracted from said entry passageway to allow said smart token to travel to said other one of said passageways.

The entry passageway may be a ramped passageway and said smart token may be allowed to pass through said passageway under the action of gravity.

The sensor may be located proximal to the point from which said smart token enters said entry passageway. The sensor may be an optical sensor which senses that a smart token is passing through said passageway when a light beam is broken along said passageway path.

The gate means may include a blade moveable between one position in which said blade is coplanar with said entry passageway to allow said smart token to travel to one of

said exit or collection passageways, and another position in which said blade is retracted from said entry passageway to allow said smart token to travel to said other exit or collection passageways.

The blade may be biased by a spring to maintain said blade coplanar with said entry passageway and a solenoid can be provided to retract said blade.

The antenna may also be located proximal to the point from which said smart token enters said entry passageway and said antenna may be a plate.

The processor may be located within said housing.

In yet another broad aspect of the invention, there is provided a method of storing and exchanging data between a smart token and a smart token reader, said smart token being of the type having an integrated circuit having memory storage capabilities, and an antenna coupled to said integrated circuit, said method comprising the steps of:

(a) sensing the entry of a smart token into a smart token slit that provides an entry into a passageway in a housing of said reader,

(b) transmitting an electromagnetic field from a token reader antenna disposed along said entry passageway, said antenna adapted to thereby establish an electromagnetic coupling to said token antenna as said smart token travels past said reader antenna; and

(c) transmitting data between a processor coupled to said antenna and said smart token through said electromagnetic coupling.

Optionally, said method further provides the step of:

(d) activating a gate means provided at the end of said entry passageway by a signal generated by said processor, thereby alternating the passage of said smart token to one of either an exit or entry passageway.

In the description and claims of this specification the word "comprise" and variations of that word, such as "comprises" and "comprising" are not intended to exclude other features, additives, components, integers or steps but rather, unless otherwise stated

explicitly, the scope of these words should be construed broadly such that they have an inclusive meaning rather than an exclusive one.

Brief description of the drawings

Notwithstanding any other forms which may fall within the scope of the present invention, preferred forms of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Fig. 1 is an exploded view of the component parts of a preferred embodiment of a smart token;

Fig. 2 is a cross-sectional view of the smart token shown in Fig. 1 when assembled;

Fig. 3 is a front view of a preferred embodiment of a smart token reader;

Fig. 4 is a side view of the smart token reader shown in Fig. 3;

Fig. 5 is an exploded rear view of the smart token reader shown in Fig. 3;

Fig. 6 is an exploded front view of the smart token reader shown in Fig. 3;

Fig. 7 is front perspective view of the smart token reader shown in Fig. 3 when assembled;

Fig. 8 is front perspective view of the smart token reader shown in Fig. 3 having a front cover removed;

Fig. 9 is a simplified diagram of the flow path for collection of the smart token by the smart card reader;

Fig. 10 is a simplified diagram of the flow path for removal of the smart token from the smart card reader;

Fig. 11 is another simplified diagram of the flow path for collection of the smart token by the smart card reader when it accepts a smart token; and

Fig. 12 is a simplified diagram of the flow path for removal of the smart token from the smart card reader when it rejects a smart token.

Detailed description of the embodiments

A preferred embodiment provides a plastic circular token referred to herein as a "smart token" used for storing and exchanging data with a token reader. The token reader having a housing and a token entry slit extending within said housing for placing said smart token therein. An entry passageway extending from the token entry slit is formed by a declining ramp having side walls extending from the base of the ramp. The entry passageway slopes downward to thereby allow the smart token to roll down the passageway by action of gravity.

An optional optical sensor or other form of sensor is located adjacent to the entry slit within the entry passageway for detecting that a smart token has been inserted into the token entry slit. The optical sensor generates a signal alert when this occurs as a beam of light is broken upon insertion of the smart token in the token entry slit. The signal is transmitted to a processor. The processor is connected to a memory having an application programme stored thereon which instructs the processor to interpret the signal generated by insertion of the token and acknowledge that a smart token has been placed into the smart card reader.

The processor is also connected to an antenna plate located along one of the sidewalls defining the entry passageway.

The smart token includes a circular plastic casing which is made up of an upper cover and a lower cover. An integrated circuit (IC) having memory storage capabilities is housed within the casing together with an antenna in the form of a wire loop, the wire loop extending around the inner perimeter of the token.

As the token travels down the entry passageway, the optical sensor transmits a signal to the processor. Upon receipt of the signal, the application program instructs the processor to exchange data with the IC of the token. The processor permits an oscillating power source to be sent to the reader antenna and thereby generates an electro-magnetic field to cause an electro-magnetic coupling with the smart token antenna. The smart token antenna carries the signal to the IC.

Referring initially to Fig. 1, there is shown an exploded perspective view of the components for a preferred form of a smart token 20. The smart token includes an antenna in the form of antenna coil 3 which is coupled to an integrated circuit (IC) 5. The IC 5 is provided with a memory for storing data thereon. The smart token also includes a base 4 which is circular and which further includes a projecting lip 8 extending from the base 4 and around the perimeter of the base 4 to form a continuous loop. The top of the lip 8 provides a sealing surface for allowing sealing with an inner surface of the lid 1 as will be explained further with reference to Fig. 2.

The base 4 further includes a pocket 7 that allows the IC 5 to be located therein and a pair of slots 6 extend through the lip 8 to allow connecting wires to electrically connect the IC 5 and antenna coil 3.

A filler material in the form of core 2 is also provided to increase the weight of the smart token by filling in the inner space within the housing as shown in assembled sectional view of Fig. 2. The core 2 has a raised core centre 12 and recess 15.

During assembly, the IC 5 is placed in the pocket 7 and two connector wires 21 and 22 extend through the slots 6 to electrically connect the IC 5 to the antenna coil 3. The walls 24 of pocket 7, and the lip 8 are deeper than the thickness of the IC 5 to protect the IC 5. A potting substance such as epoxy or hot melt glue may cover the IC 5 when located in the pocket 7, to thereby protectively embed the chip and the connector wires 21,22.

Fig. 2 illustrates a sectional view through the smart token when fully assembled. The lid 1 and base 4 are joined together by gluing, welding or snap fitting. The sealing surface of the lip 8 contacts an inner surface of lid 1 as shown in Fig. 2. The lid 1 includes a hole 14 in the centre of the lid 1 and a skirt 9 extending from the lower surface of the lid 1 to form a continuous loop around the perimeter of the lid 1. The top surface of the skirt 9 is used as a sealing surface to seal with the perimeter of the base 4, adjacent the lip 8.

In assembly, as the antenna coil 3 is made from a very fine wire and is supported by being located in a chamber 10 defined by the space between the lip 8 and the skirt 9 as shown in Fig. 2. The chamber 10 serves as a longitudinal former and keeper for the antenna coil 3.

The lid 1 and base 4 are preferably constructed from plastic. Most commonly used plastics have a specific gravity (SG) of approximately 1.2. Metals used in the production of coins have an SG of approximately 8.0 (the exception being aluminium which has an SG of 2.7). Therefore, a solid plastic token will have a mass which is approximately 15% of the mass of the same size metal coin.

When the smart token is gravity fed through a smart token reader, the likelihood of correct operation will be enhanced if the token has a high mass. Furthermore, there are also ergonomic considerations in having a token of higher mass, given that a token of higher mass is easier to manipulate by hand and a heavier token will feel more substantial to a person handling the token. Therefore, in order to increase the mass of the token, in assembly a core 2 is located in an inner chamber defined by the inner space within the lip 8.

The core 2 is entrapped between the base 4 and lid 1 as shown in Fig. 2. Additionally, the centre of the core is raised on both sides 12 and 13 and protrudes into the holds 14 and 15. This allows the core 2 to form a greater proportion of the total mass of the smart token so that the mass of the plastic token exceeds 15% of the mass of the same size metal coin.

Additionally, the exposure of the raised centre sections 14 and 15 (Fig. 1) can be exploited by increasing the number of colour combinations which can be used for identification of the smart token.

Turning now to the token reader, a front view of the token reader is now shown in Fig. 3, in which the dashed lines indicate the internal features within the housing 17 of the token reader. A side view of the reader is shown in Fig. 4. Fig. 5 shows a back exploded perspective view of the token reader. Fig. 6 illustrates a front exploded perspective view of the token reader. Fig. 7 illustrates a front panel view and Fig. 8 illustrates a front panel view with a top panel open.

The token reader includes an entry passageway 19 connecting to a ramp 31 which extends downwardly from point 32 to point 33, and an upper front wall 34 and rear wall 35 (refer to Fig. 5 and 6). The rear wall 35 acts as a friction surface, thereby reducing the rate of acceleration of the token as it rolls down ramp 31.

The upper front wall 34 is hinged at the upper corner by hinge 36. Hinge 36 incorporates a spring which biases the upper wall 34 parallel to the rear wall 35. The lower front wall 37 is fixed to the rear wall 35. The upper edge 38 is curved outwards in a direction perpendicular to the main surface.

An optical sensor 40,41 is positioned adjacent to the slit 19 so that light from the emitter, part of the sensor 40,41 passes across the token path through light pipe 42 on the front wall and returns across the path to the receiver part. The sensor which includes an emitter 40 and receiver 41 detects the presence and passing of a token when the light beam from the emitter 40 to receiver 41 is broken.

An antenna plate 60 (refer to Fig. 6) is also provided at the rear of the reader, close to the optical sensor emitter 40 and receiver 41. It is preferably placed at the entry point 32 so that the read distance of the token is minimised and the read time is maximised due to the fact that the token will continue to accelerate under the action of gravity from the entry point 32 down towards the endpoint 33 of the ramp 31.

A gate means in the form of gate 39 is provided below endpoint 33 of the ramp 31. The gate includes a blade 61 which in its default position is coplanar with an exit passageway 26. Passageway 26 is defined by a lower ramp 51 which extends from point 52 (directly beneath endpoint 33 of the entry passageway 30) to the endpoint 53, and lower front wall 37 and rear wall 35. The endpoint 53 of ramp 51 leads the token into exit hole 25.

The gate 39 alternates the blade 61 between the passageway 26 and an alternate passageway 27, directly beneath the blade 61. The passageway 27 directs the token into a collection chamber 23 for storage of the smart token as appropriate. The blade 61 is moveable by action of a solenoid 62 as when the solenoid 62 is energised, it retracts the blade 61. An internal spring (not shown) acts to keep the blade 61 closed when the solenoid 62 is not energised. The solenoid is activated by a processor (not shown) which is located within the smart card reader. In some other embodiments, the processor and associated circuitry should be located remote from the smartcard reader. The processor is connected to a memory having an application program stored thereon.

Fig. 7 is a front perspective view of the smart card reader when it is fully assembled.

Should a token or a non-token, that is a malfunctioning token or other object, be inserted into smart token slot 19 and fail to proceed through the entry passage, the upper front wall 34 can be momentarily opened as shown in Fig. 8 so as to overcome constriction of the object and thereby allow the object to fall directly to the exit passage 26 or the collection passage 27.

In use, when a user inserts a smart token into the slot 19, it rolls down the entry passageway 30 from point 32 to endpoint 33 under the action of gravity. As it is inserted into the smart token slot 19 it breaks the beam of light emitted from light emitter 40 to the optical receiver 41, which sends off a signal to the processor (not shown). The processor is instructed from receiver 41 that an object has been placed inside the smart token slot 19 of the smart card reader.

As the token rolls down the entry passageway 30, the smart token comes into the reading range of the antenna plate 60. The antenna plate 60 generates an electro-magnetic field which is received by the smart token antenna coil 3. A modulated signal, eg an RF signal at 13.56 MHz, is carried by the antenna coil 3 and imparted to the token's IC 5. The IC 5 becomes energised and relays data to the smart card reader by transmitting data back through the antenna coil 3 as an acknowledgment signal. The acknowledgment signal is sent back to the antenna 60 which forwards the signal onto the processor for recording as data by the application program as appropriate. Depending upon the signal received from the processor, the solenoid 62 may become energised or de-energised.

If the application program instructs the processor to accept the token based upon the emitted data from the IC 5, the solenoid 62 is energised, the blade 61 is opened by gate 39 and therefore does not allow the token to travel on the exit passageway 26 but directs the token to the exit collection passageway 27 for collection in the collection chamber 23 as shown the simplified schematic diagram of Fig. 9. Fig 11 also shows another simplified path of the token in which the token is 'Accepted' into the collection chamber 23 by being passed off passageway 30 when blade 61 is retracted under the action of the solenoid 62. Another sensor (not shown) can also provided in passageway 27 and can be connected to

the processor to ensure that the token has passed through the passageway 27. Upon receipt of the signal indicating that the smart token has been collected, the processor may instruct another action to be taken such as raising an access gate to allow a person to pass into an area or the release of a vendible product in a vending machine.

Alternatively, if the application program instructs the processor not to accept the token but to reject it, the solenoid 62 does not receive a signal and the blade 61 remains intact as shown in Fig. 10, wherein the token rolls off entry passageway 30 at point 33, onto blade 61 and down ramp 51 and through to exit hole 25. Fig 12 also shows another simplified path of the token in which the token is 'Rejected' and is passed onto the ramp 26 and through to exit hole 25.

When there is no power imparted to the mechanism, the solenoid gate is not energised and takes the closed ie. the 'reject' position. Any token entry in the mechanism will be returned without intervention by the user or the mechanism.

When a non-token (malfunctioning token or other object) enters a mechanism it will be sensed at the position of the optical sensor. When the antenna fails to detect a correct signal from the token within a predetermined time the gate 40 remains close and the token simply rolls out through to the exit hole 25.

The curved surface 38 of the lower front wall 37, serves as a funnelling device which increases the probability that the object being rejected will remain correctly orientated and within the mechanism.

It will be appreciated that as it is not necessary to provide a conductive surface on the smart token, it is not necessary to orient the token within the smart token reader. Rather the smart token automatically orients itself as it travels through the entry passageway 30 and exit 26 or collection 27 passageway . Additionally, it is not necessary to provide power to the smart token in order to exchange data therewith due to generation of the electromagnetic field generated by the antenna plate 60.

The smart tokens and reader of the preferred embodiment can be implemented in a range of applications, as such as raising an access gate to allow a person to pass into an area such as to access public transport or for access to a sporting venue. Alternatively, the

release gate may be raised on a vending machine to release a vendible product stored therein.

It would be appreciated by a person skilled in the art that numerous variations and/or modifications may be made to the present invention as shown in the specific embodiments without departing from the spirit or scope of the invention as broadly described. The present embodiments are therefore, to be considered in all respects to be illustrative and not restrictive.

Claims

1. A smart token reader for reading a smart tokens or disc containing an internal communications mechanism, said reader including:

a body having a first passageway defined therein for the insertion of a smart token;

said first passageway including a first inclined ramp along which said token rolls upon insertion into said reader;

an antenna detector located adjacent said passageway for reading information from said token as it rolls along said passageway;

a selection gate located at the end of said passageway for altering the course of said token so that it is forwarded to one of at least two further passageways depending on the position of said selection gate; and

wherein the position of said selection gate is set by said reader upon the reading of information stored within said token by said antenna detector.

2. A reader as claimed in claim 1 wherein a first one of said two further passageways includes a second inclined ramp along which said token rolls and an exit portal at a distal end of said second inclined ramp from which said token exits from said reader.

3. A reader as claimed in any previous claim wherein a wall of said first passageway is formed from a detachable front panel of said reader.

4. A reader as claimed in claim 3 wherein said first inclined ramp is formed by an elongated protrusion along said detachable front panel.

5. A reader as claimed in claim 3 or claim 4 wherein said detachable front panel is attached to said reader by means of a resiliently biased hinge, resiliently biased in a closed position.

6. A reader as claimed in any previous claim wherein a wall of said second passageway is formed from a second front panel of said reader.

7. A reader as claimed in claim 6 wherein said second inclined ramp is formed by an elongated protrusion along said second front panel.

8. A reader as claimed in claim 6 wherein said second front panel includes an upturn lip along which said token rolls upon exiting of the second front panel.

9. A smart token for use in storing and exchanging data with a token reader device adapted to read and/or write data to said token, said token comprising:

a casing;

an integrated circuit having memory storage capabilities housed within said casing; and

an antenna housed within said casing and coupled to said integrated circuit for communication with an external system, said antenna including a coil formed substantially around the circumference of the token;

wherein said token is adapted such that when placed in the proximity of an electromagnetic field generated by said token reader, an electromagnetic coupling to said antenna is established for the transmission of information from said integrated circuit to said token reader.

10. A smart token as claimed in claim 9, wherein said casing is formed from two covers adapted to be joined together.

11. A smart token as claimed in claim 10, wherein a projection extends from a surface of each cover such that each projection sealingly abuts the surface of said other cover and thereby forms at least one chamber for housing said integrated circuit and said antenna.

12. A smart token as claimed in any one of the above claims, wherein said antenna is formed as a loop and is positioned to extend within an inner wall of said chamber, adjacent to the perimeter of said casing.

13. A smart token as claimed in claim 12, wherein when said covers are joined together, one of said projections forms an inner loop and said other projection forms an outer loop, said inner loop being juxtaposed within said outer loop, to thereby form an inner chamber within said inner loop and an outer chamber between said inner and outer loops.

14. A smart token as claimed in claim 13, wherein said antenna loop is located within said outer chamber.

15. A smart token as claimed in any one of claims 10 to 14, wherein said integrated circuit is located within a protective pocket that extends from an inner surface of one of said covers.

16. A smart token as claimed in claim 15, wherein said pocket is positioned within said inner chamber.

17. A smart token as claimed in any one of claim 9 to claim 16, wherein a filler material is provided within said inner chamber.

18. A smart token as claimed in claim 17, wherein the specific gravity of the filler material is greater than the base plastic.

19. A smart token as claimed in claim 18, wherein at least one slot is provided in the inner loop adjacent to said pocket, to permit electromagnetic pulse coupling of said integrated circuit and said antenna loop.

20. A smart token as claimed in claim 9 to claim 16, wherein said casing is substantially circular.

21. A smart token reader for use in storing and exchanging data with a smart token, said smart token of the type having a casing; an integrated circuit having memory storage capabilities housed within said casing; and a token antenna coupled to said integrated circuit; said smart token reader comprising:

a housing having a token entry slit extending therein to allow a smart token to enter the housing; and

an entry passageway within said housing and extending from said token entry slit, to thereby permit passage of said smart token;

a reader antenna located along said entry passageway, said reader antenna adapted to transmit an electromagnetic field to thereby establish an electromagnetic coupling to said token antenna as said smart token travels past said reader antenna; and

a processor coupled to said reader antenna for the transmitting data to and/or receiving data from said smart token when said electromagnetic coupling has been established.

22. A smart token reader according to claim 14 further comprising a sensor located along said entry passageway to sense that said smart token is passing through said entry passageway.

23. A smart token reader as claimed in claim 22, wherein said entry passageway is a ramped passageway and said smart token passes through said passageway under the action of gravity.

24. A smart token reader as claimed in claim 22 or claim 23, wherein said sensor is located proximal to the point from which said smart token enters said entry passageway.

25. A smart token reader as claimed in claim 24, wherein said sensor is an optical sensor which senses that a smart token is passing through said entry passageway when a light beam is broken along said entry passageway path.

26. A smart token reader as claimed in any one of claims 22 to 25, wherein said antenna is located proximal to the point from which said smart token enters said entry passageway.

27. A smart token reader as claimed in claim 26, wherein said antenna is a plate.

28. A smart token reader as claimed in any one of claims 23 to 27, wherein a gate means is located at an end of said entry passageway and is activated by a signal generated by said processor, said gate means being adapted to alternate the passage of said smart token to either an exit passageway or a collection passageway depending upon said signal generated by said processor, said collection passageway leading to a chamber within said housing for storage of said smart token and said exit passageway leading to an exit point from said housing.

29. A smart token reader as claimed in claim 28, wherein said gate means includes a blade moveable between one position in which said blade is coplanar with said entry passageway to allow said smart token to travel to one of either said exit or collection passageways, and another position in which said blade is retracted from said entry passageway to allow said smart token to travel to said other one of said passageways.

30. A smart token reader as claimed in claim 29, wherein said blade is biased by a spring to maintain said blade coplanar with said entry passageway and wherein a solenoid is provided to retract said blade.

31. A smart token reader as claimed in claim 27, wherein said processor is located within said housing.

32. A method of storing and exchanging data between a smart token and a smart token reader, said smart token being of the type having an integrated circuit having memory storage capabilities, and an antenna coupled to said integrated circuit, said method comprising the steps of:

(a) sensing the entry of a smart token into a smart token slit that provides an entry into a passageway in a housing of said reader,

(b) transmitting an electromagnetic field from a token reader antenna disposed along said entry passageway, said antenna adapted to thereby establish an electromagnetic coupling to said token antenna as said smart token travels past said reader antenna; and

(c) transmitting data between a processor coupled to said antenna and said smart token through said electromagnetic coupling.

33. A method as claimed in claim 32, wherein said method further provides the step of:

(d) activating a gate means provided at the end of said entry passageway by a signal generated by said processor, thereby alternating the passage of said smart token to one of either an exit or collection passageway.

34. For use in storing and exchanging data with a token reader device according to any one of claims 22 to 32, a smart token comprising:

a casing;

an integrated circuit having memory storage capabilities housed within said casing; and

an antenna housed within said casing and coupled to said integrated circuit;

wherein said token is adapted such that when placed in proximity to an electromagnetic field generated by said token reader, an electromagnetic coupling to said antenna is established and wherein said antenna is adapted to carry an electromagnetic pulse when said electromagnetic coupling has been established and thereby impart a digital signal to or receive a digital signal from, said integrated circuit.

35. A smart token for insertion in a token reader adapted to receive said token and exchange data therewith, said token comprising:

a casing;

an integrated circuit having memory storage capabilities housed within said casing; and

an antenna housed within said casing and coupled to said integrated circuit;

wherein said token is adapted such that when placed in proximity to an electromagnetic field generated within said token reader, an electromagnetic coupling to said antenna is established and wherein said antenna is adapted to carry an electromagnetic pulse when said electromagnetic coupling has been established and thereby impart a digital signal to or receive a digital signal from, said integrated circuit.

36. A smart token, substantially as herein described with reference to the accompanying drawings.

37. A smart token reader, substantially as herein described with reference to the accompanying drawings.

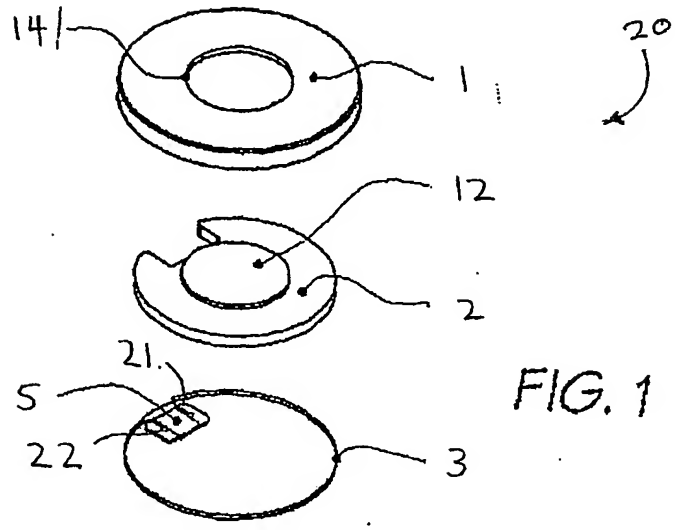
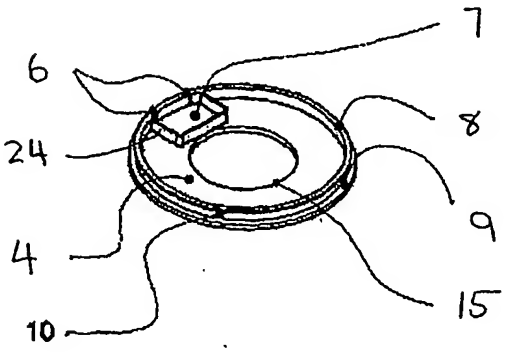


FIG. 1



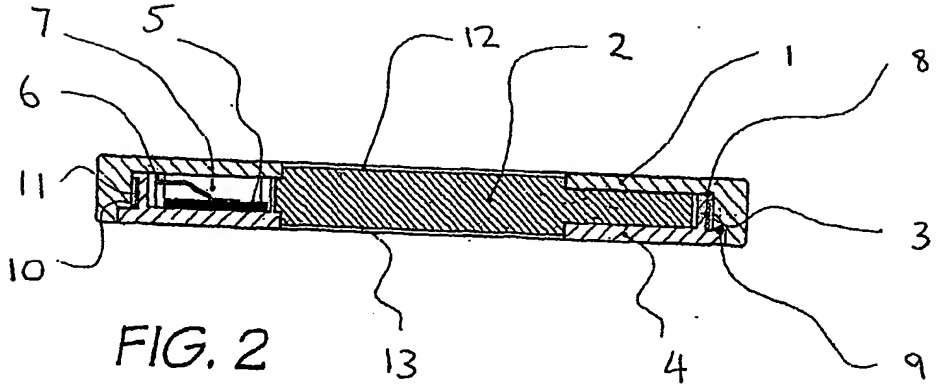


FIG. 2

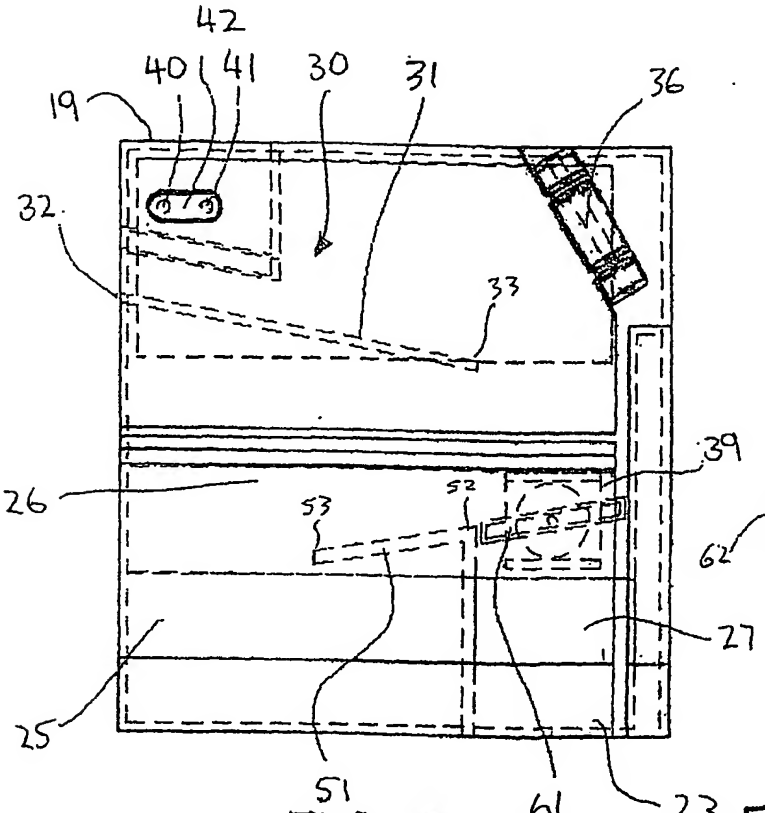


FIG. 3

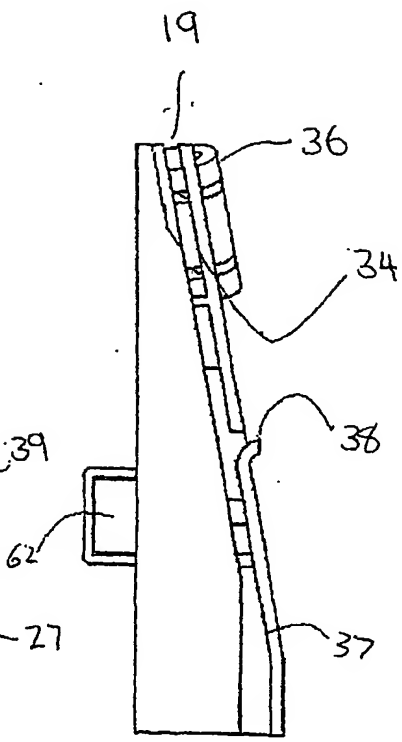


FIG. 4

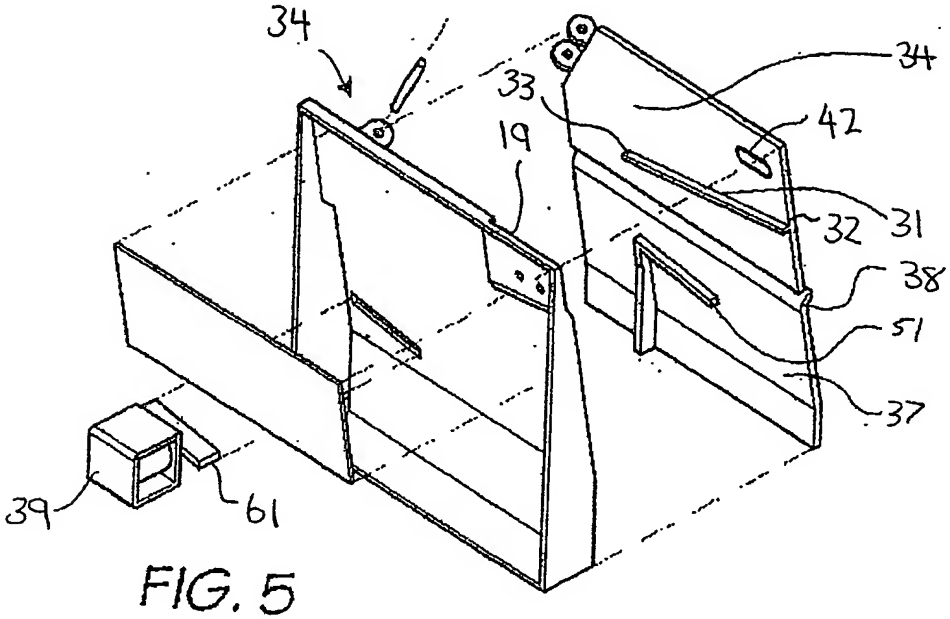


FIG. 5

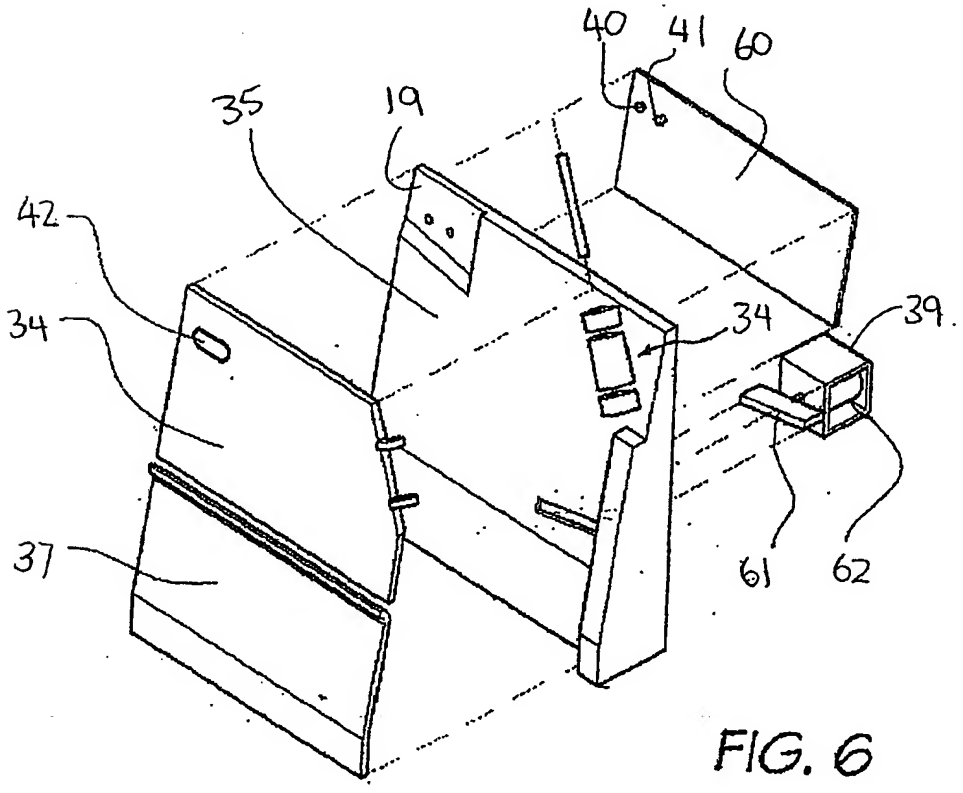


FIG. 6

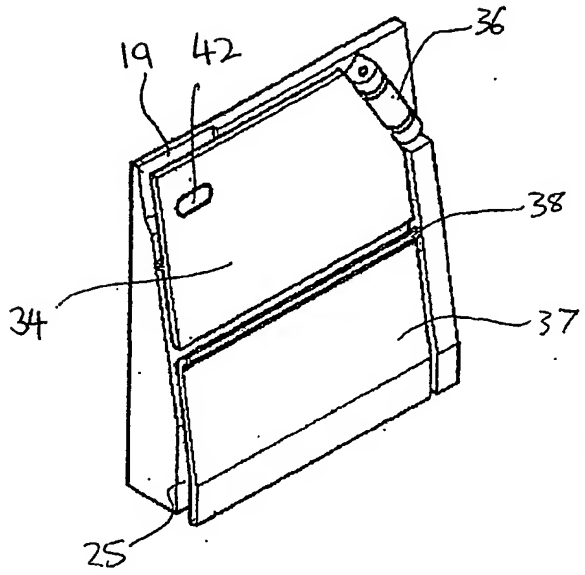


FIG. 7

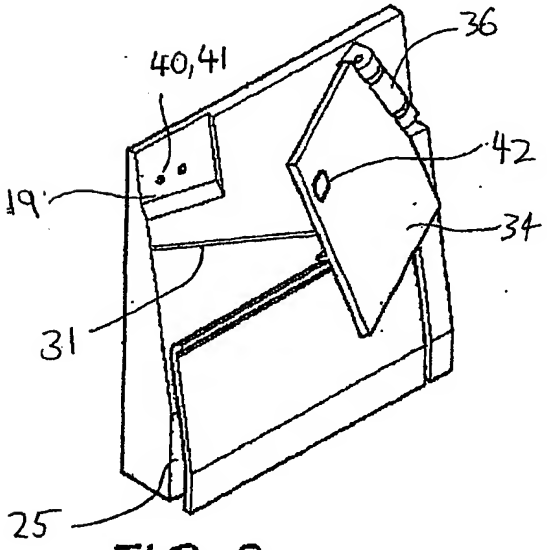


FIG. 8

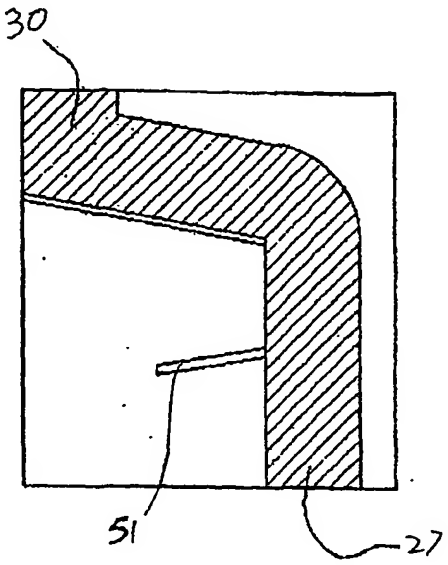


FIG. 9

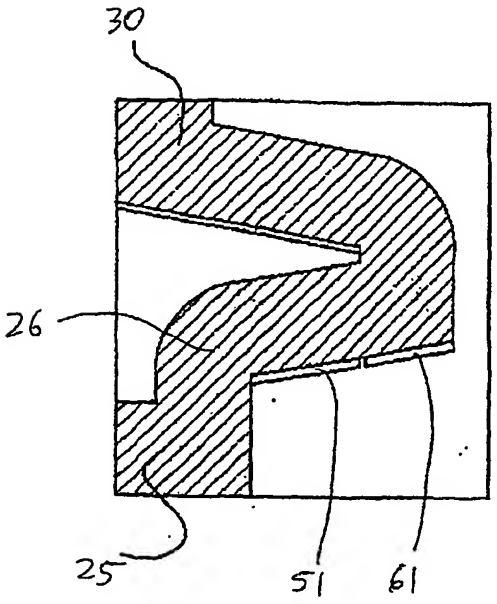


FIG. 10

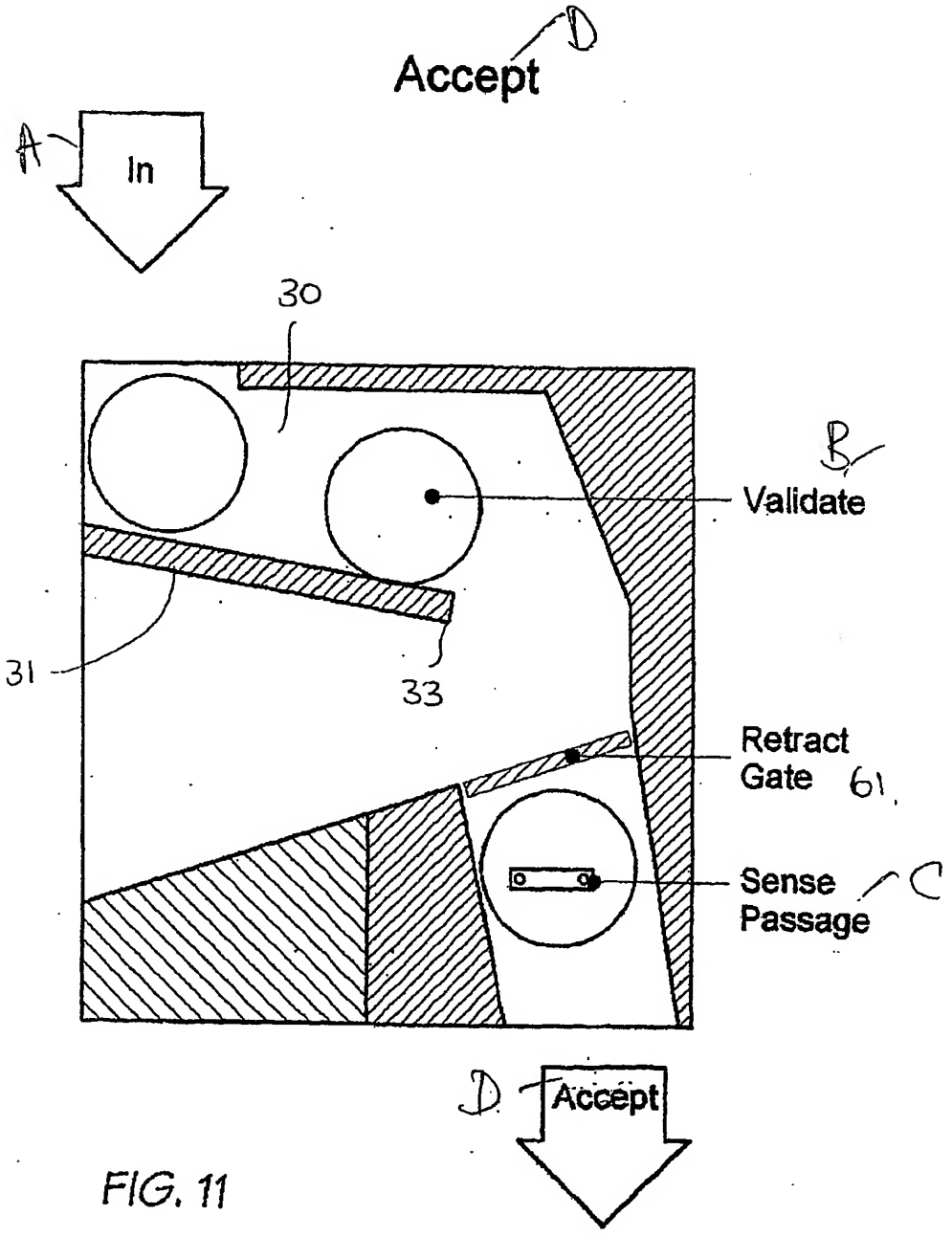

Accept
D
A
In
30
B
Validate
31
33
Retract
Gate 61
Sense
Passage
C
D
Accept

FIG. 11

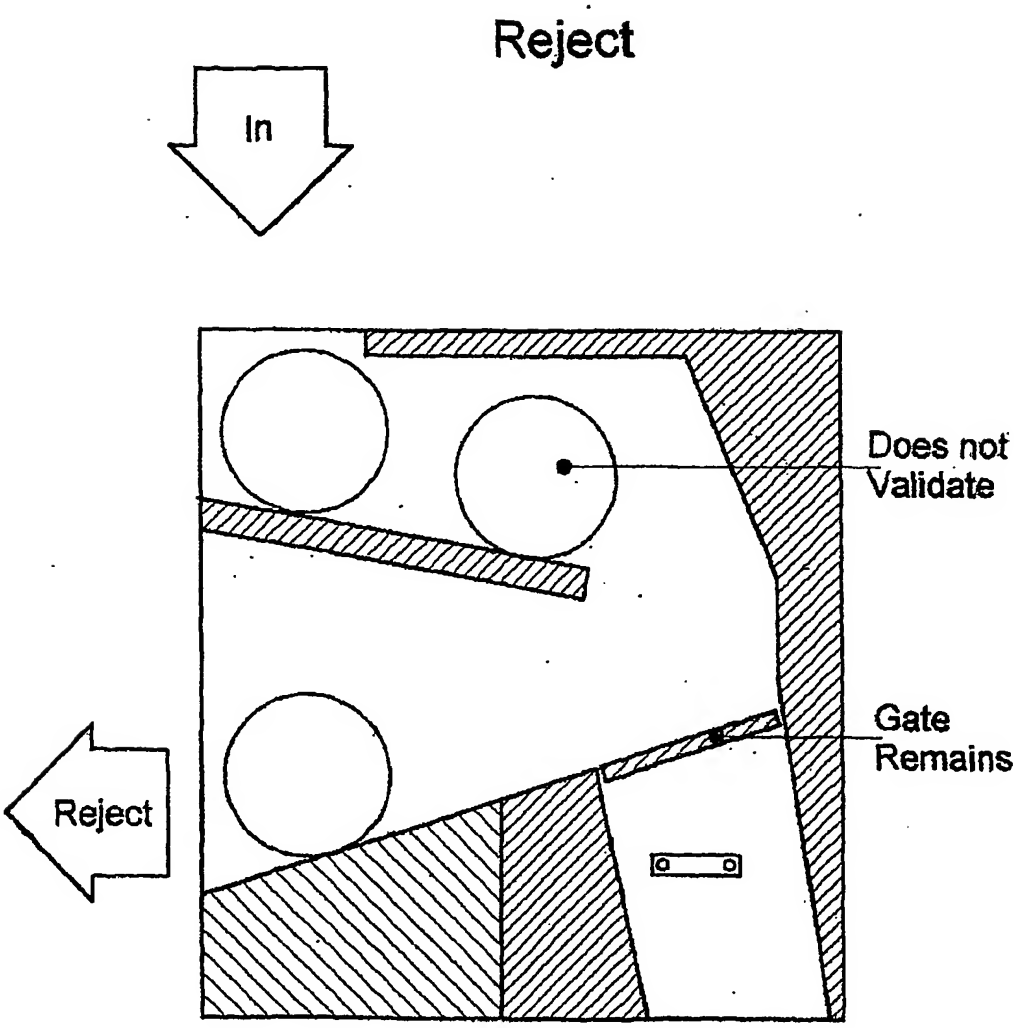


FIG. 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU01/01571

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. [7]: G06K 19/07, 13/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC G06K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
AU:IPC AS ABOVE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WPAT,USPTO

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 0057344A, LINK PACK LIMITED, 28 September 2000 Pages 1 and 2	9-20,34,35
X	WO 0025254A, SCHLUMBERGER SYSTEMES, 4 May 2000	21-27,31,32
X	US 5436441A, INOUE, 25 July 1995	21-27,31,32

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 January 2002	- 5 FEB 2002
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized officer **S KAUL** Telephone No : (02) 6283 2182

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU01/01571

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5841122A, KIRCHHOFF, 24 November 1998	
A	US 5594233A, KENNETH et al, 14 January 1997	
A	US 5905252A, MAGANA, 18 May 1999	

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/AU01/01571

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
WO	200057344	AU	200033109	EP	1161738	GB	2350461
WO	200025254	EP	1125240	FR	2785419		
US	5436441	EP	541323	JP	5128324		
US	5841122	CN	1134766	CZ	9601384	DE	4432324
		EP	732011	FI	962006	HU	76003
		PL	315117	SK	596/96	WO	9608880
US	5594233	EP	712087	JP	8235330	ZA	9509441
US	5905252	CN	1221158	EP	924633	JP	11232396
		US	6186401				

END OF ANNEX